

Introduction

Spinal dural arteriovenous fistulae (dAVF) cause progressive myelopathy, but the progression of symptoms can be halted and often reversed upon accurate diagnosis and treatment (Saladino et al, 2010). Digital subtraction angiography (DSA) remains the gold standard for localizing the level of the fistula, but a full spinal angiogram requires long fluoroscopy times and high doses of iodinated contrast. We present a retrospective analysis of our recent experience in the diagnosis and treatment of spinal dAVF. We correlate the ability to localize the level of spinal dAVF on MR angiography (MRA) to fluoroscopy time and iodinated contrast used during spinal DSA.

Methods

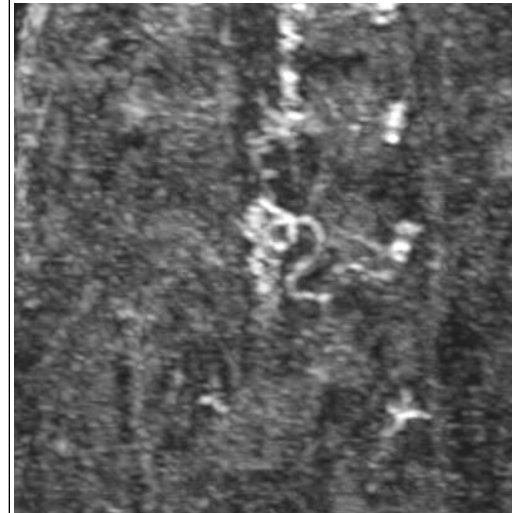
From 2010 to 2015, 19 consecutive patients with spinal dAVF were treated at our institution. The demographics, MRI/MRA results, fluoroscopy time and amount of iodinated contrast used during initial angiography, treatment modality, post-operative angiography results, neurological exam at follow-up, and pre- and post-operative modified Rankin Scale (mRS) were analyzed. Fluoroscopy time and iodinated contrast used between groups were compared using a two-tailed unequal variances t-test. A $P < 0.05$ was considered significant.

Results

Of 19 patients, 16 were male and 3 were female. The average age was 68, range 43-85. The fistula locations were 1 cervical, 9 thoracic, 8 lumbar, and 1 sacral. Initial MRI/MRA localized the dAVF within 3 levels in 13 patients (68%, Group A) and did not localize the dAVF in 6 patients (32%, Group B). Groups A and B averaged 15.7 and 43.2 minutes of fluoroscopy time ($p = 0.042$) and used an average of 70 and 180 mL of iodinated contrast ($p = 0.047$), respectively. 18 patients underwent microsurgical ligation; 1 patient underwent embolization initially, but symptomatic recurrence required surgery. 17 of 19 patients had post-operative angiograms: 15 of these demonstrated successful obliteration, 1 was subsequently embolized, and 1 required re-operation. On follow-up examination, 14 patients improved neurologically, 3 were unchanged, 1 was worse, and 1 was lost to follow up. In terms of functional independence as measured by mRS, 4 improved, 13 were stable, and 1 was worse.

	MRA localizes lesion	MRA does not localize lesion
Number of Patients	13	6
Average fluoro time	15.7	43.2
Average contrast used	70	180

Gadolinium Bolus MR Angiogram



Coronal reconstruction demonstrating spinal dural AV fistula at the left T11-L1 intervertebral foramen.

Conclusions

Approximating the location of spinal dAVF on MRI/MRA is associated with significantly less fluoroscopy time and iodinated contrast used. This association has been reported (Luetmer et al, 2005), but this is the first time statistical analysis has been applied to the results. Micro-surgical ligation of the dAVF had a high obliteration rate, but post-operative angiography is necessary. dAVF obliteration usually resulted in symptom improvement, but mRS was generally not improved, likely due to long-standing myelopathy prior to disease recognition.

References

Luetmer PH, Lane JJ, Gilbertson JR, Bernstein MA, Huston J, Atkinson JLD: Preangiographic evaluation of spinal dural arteriovenous fistulas with elliptic centric contrast-enhanced MR Angiography and effect on radiation dose and volume of iodinated contrast material. *AJNR Am J Neuroradiol* 26:711-718, 2005
Saladino A, Atkinson JLD, Rabinstein AA, Piepgras DG, Marsh WR, Krauss WE, et al: Surgical treatment of spinal dural arteriovenous fistulae: a consecutive series of 154 patients. *Neurosurgery* 67:1350-1357; discussion 1357-1358, 2010

Digital Subtraction Angiogram



DSA run in PA view during arterial phase showing fistulous connection at the left T11-L1 foramen.